PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: JOHN LOCKE

840,455

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COMPLETE SPECIFICATION

Improvements in, or relating to the Reduction of Torsional Oscillation in Rollers

We, THE BRITISH RAYON RESEARCH ASSOCIATION, a British Association of Bridgewater House, Whitworth Street, Manchester, 1 in the County of Lancaster, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns the reduction of torsional oscillation in rollers.

In drafting systems, used for processing staple fibres, irregularities in the linear density of the material after processing can be introduced by variations in the surface speeds of the various rollers which are used to effect the drafting. This particularly applies on speed frames which may have rollers some forty feet in length.

The non-uniform motion of the rollers can result from two main causes. The first of these is associated with forced torsional vibrations usually introduced, or triggered off, by defects in the gearing and gearing supports of the driving system. The second type of vibration is a torsional oscillation usually at the natural frequencies of the roller. Various reasons have been put forward to account for the presence of this second type of vibration which usually occurs at roller speeds of less than 10 r.p.m. The reason finding most general acceptance is that the phenomenon is due to "stick-slip" friction at bearings mounted at regular intervals along the frame.

Vibrations due to the first-mentioned cause can usually be substantially prevented by ensuring that the roller driving gearing is performing efficiently. Up to the present no effective cure for the second class of vibration has been found.

The object of our invention is to reduce torsional oscillation in rollers having a length many times their diameter and which are driven at one end.

According to the invention where a long roller (i.e. a roller having a length many times its diameter) is driven at a point remote from one end, such as the other end, and is subject to torsional oscillations, usually at its natural frequency, and of the type usually ascribed to "stick-slip" friction at bearings supporting the roller between the point at which the drive is applied and the end remote from said point, we arrange that restraint to the roller rotation is applied at a point or points spaced from the drive in such manner as substantially to reduce said oscillations. The restraint may, for example, be applied by means of a brake, or by causing the roller to drive some other mechanism.

In applying the invention to a textile frame in which drafting of staple fibres takes place, such as a speed frame having drafting rollers about forty feet in length we first ensure that the gears of the driving mechanism are functioning efficiently to reduce to a minimum any forced torsional vibration which might otherwise arise due to defects therein. Then we arrange a friction brake consisting of a weighted loop of leather or, alternatively two brake shoes and associated linings diametrically opposed in relation to the roller, acting on a brake wheel at the end of each roller concerned remote from the driven end.

The invention will now be described further by way of example, with reference to the accompanying drawings, in which the three figures are diagrammatic perspective views of three embodiments of the invention.

In Fig. 1 rollers 11, 13 and 15 are the lower rollers of a conventional textile drafting frame. All three rollers are driven at the end remote from that shown in the drawing. Rollers 12, 14 and 16 are the upper co-operating rollers and are weighted into peripheral contact with rollers 11, 13 and 15 and revolve in contact therewith.

At the free end of the driven roller 11, there is rigidly attached a co-axial brake wheel 17 around which is hung a leather loop 18 carrying at its free end a weight 19. The

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Price 25p

other end of the loop 18 is attached to the framework of the machine at 20.

Fig. 2 shows an alternative means of applying restraint in which the braking loop 18 and weight 19 are replaced by a belt 21 driving an assisting roller.

In Fig. 3 yet another alternative is shown and in this case restraint is applied by the introduction of a weighting roller 23 resting in contact with lower rollers 11 and 13. Such a method of application of restraint can easily be extended along the whole length of the drafting frame but allows drafting to take place at only one stage, namely between the nips at point *a* and at point *b*, since rollers 11 and 13 do, of necessity, revolve at the same surface speed.

Restraint may well be distributed along the length of the frame by a variation of the method of Fig. 1. At various stages along the length of the drafting frame, means, such as gearing, is provided for transmitting restraint from braking means of the forms shown in Figs. 1 and 2 to the driven bottom roller.

Brakes of other types, can of course be used, such as disc type brakes, electro-magnetic brakes or eddy-current brakes. Alternatively a drive to some other mechanism could be taken from the end of the roller.

The magnitude of the restraining torque required to reduce the amplitude of the oscillations to zero is dependent upon the speed of revolution of the driven rollers and can be easily determined by experiment. Values of torque in excess of the required amount will not introduce any difficulties; the excess might be considered to be merely the expenditure of unnecessary effort. It has been found convenient to use the same braking torque for all drafting conditions and so avoid the necessity of duplicating braking units. Consequently a torque of approximately 60 lb. ins. is applied, such figure adequately damping oscillations occurring at the drafting rollers speeds normally used.

WHAT WE CLAIM IS:—

1. A method of reducing torsional oscillations in a long roller (i.e. a roller having a length many times its diameter) driven at a point remote from one end, such as the other end, and subject to torsional oscillations, usually at its natural frequencies, and of the type usually ascribed to " stick-slip " friction at the bearings supporting the roller between the point at which the drive is applied and the end remote from said point, in which restraint is applied to the rotation of the said roller at a point or points spaced from the drive in such manner as substantially to reduce said oscillations.

2. A method as claimed in claim 1 in which the said restraint is applied by means of a brake.

3. A method as claimed in claim 2 in which the brake consists of a brake wheel, rigidly attached co-axially with the roller to be restrained, and co-operating braking means.

4. A method as claimed in claim 3 in which the co-operating braking means consists of a loop of leather attached by one end to a drafting frame, the free end bearing a weight, the loop being hung over the braking wheel in conventional manner.

5. A method as claimed in claim 3 in which the co-operating braking means consisting of two brake shoes bearing linings and acting on the periphery of brake disc at diametrically opposite points.

6. A method as claimed in claim 2 in which the brake consists of a conventional disc type brake.

7. A method as claimed in claim 2 in which the brake consists of an electro-magnetic brake.

8. A method as claimed in claim 2 in which the brake consists of an eddy-current brake.

9. A method as claimed in claim 1 in which the said restraint is provided by arranging for the free end of the roller to drive some other mechanism.

10. A method as claimed in claim 9, as applied to the roller of a drafting frame, in which the said other mechanism consists of the assisting roller or rollers.

11. A method as claimed in claim 9 in which the said restraint is provided by weighted rollers placed in contact with the first two lower drafting rollers and rotating in contact therewith during operation.

12. A method as claimed in claim 1 or 2, or any one of claims 6 to 11, in which the said restraint is distributed throughout the length of a machine.

13. A method of reducing torsional oscillations in a long roller substantially as hereinbefore described with reference to the accompanying drawings.

14. A machine having a long roller (i.e. a roller having a length many times its diameter) and means for driving same at a point remote from one end, such as the other end, said roller being subject to torsional oscillations, usually at its natural frequencies, and of the type usually ascribed to stick-slip friction at bearings supporting the roller between the point at which the drive is applied and the end remote from said point, including means for applying restraint to the rotation of said roller at a point or points spaced from the drive in such manner as substantially to reduce said oscillations.

15. A machine as claimed in claim 14 having a long roller provided with means for reducing torsional oscillations therein substantially as hereinbefore described with reference to and as illustrated in Fig. 1, 2 or 3 of the accompanying drawings.

For the Applicants.

E. K. DUTTON & COMPANY,
Chartered Patent Agents,
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PROVISIONAL SPECIFICATION

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The non-uniform motion of the rollers can result from two main causes. The first of these is associated with forced torsional vibrations usually introduced, or triggered off, by defects in the gearing of the driving system. The second type of vibration is a torsional oscillation usually at the natural frequencies of the roller. Various reasons have been put forward to account for the presence of this second type of vibration, the one finding most general acceptance being that the phemonenon is due to "stick-slip" friction at bearings mounted at regular intervals along the frame.

Vibrations due to the first-mentioned cause can usually be substantially prevented by ensuring that the roller driving gearing is performing efficiently. Up to the present no effective cure for the second class of vibration has been found.

The object of our invention is to reduce torsional oscillation in rollers having a length many times their diameter and which are driven at one end.

According to the invention where a long roller (i.e. a roller having a length many times its diameter) is driven at a point remote from one end, such as the other end, and is subject to torsional oscillations, usually at its natural frequency, and of the type usually ascribed to "stick-slip" friction at roller bearings supporting the roller between the point at which the drive is applied and the end remote from said point, we arrange that restraint to the roller rotation is applied at a point or points spaced from the drive in such manner as substantially to reduce said oscillations. The restraint may, for example, be by way of a brake, or by causing the roller to drive some other mechanism.

In applying the invention to a textile frame in which drafting of staple fibres takes place, such as a speed frame having drafting rollers about forty feet in length we first ensure that the gears of the driving mechanism are functioning efficiently to reduce to a minimum any forced torsional vibration which might otherwise arise due to defects therein. Then we arrange a friction brake consisting of a weighted loop of leather at the end of each roller concerned remote from the driven end. The degree of weighting necessary for best results in any particular case can easily be ascertained by experiment, merely by checking the torsional oscillations under operating conditions for various weightings, and adopting that weighting which gives the best results.

Brakes of other types, can of course be used, such as electro-magnetic brakes or eddy-current brakes. Alternatively a drive to some other mechanism could be taken from the end of the roller.

In some cases we may prefer to "distribute" the restraint along a part of the length of the roller by applying it continuously therealong, or at intervals therealong.

We believe the success of the invention depends on a roller being maintained, whilst rotating, in a state of torsional strain.

For the Applicants.
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840,455 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

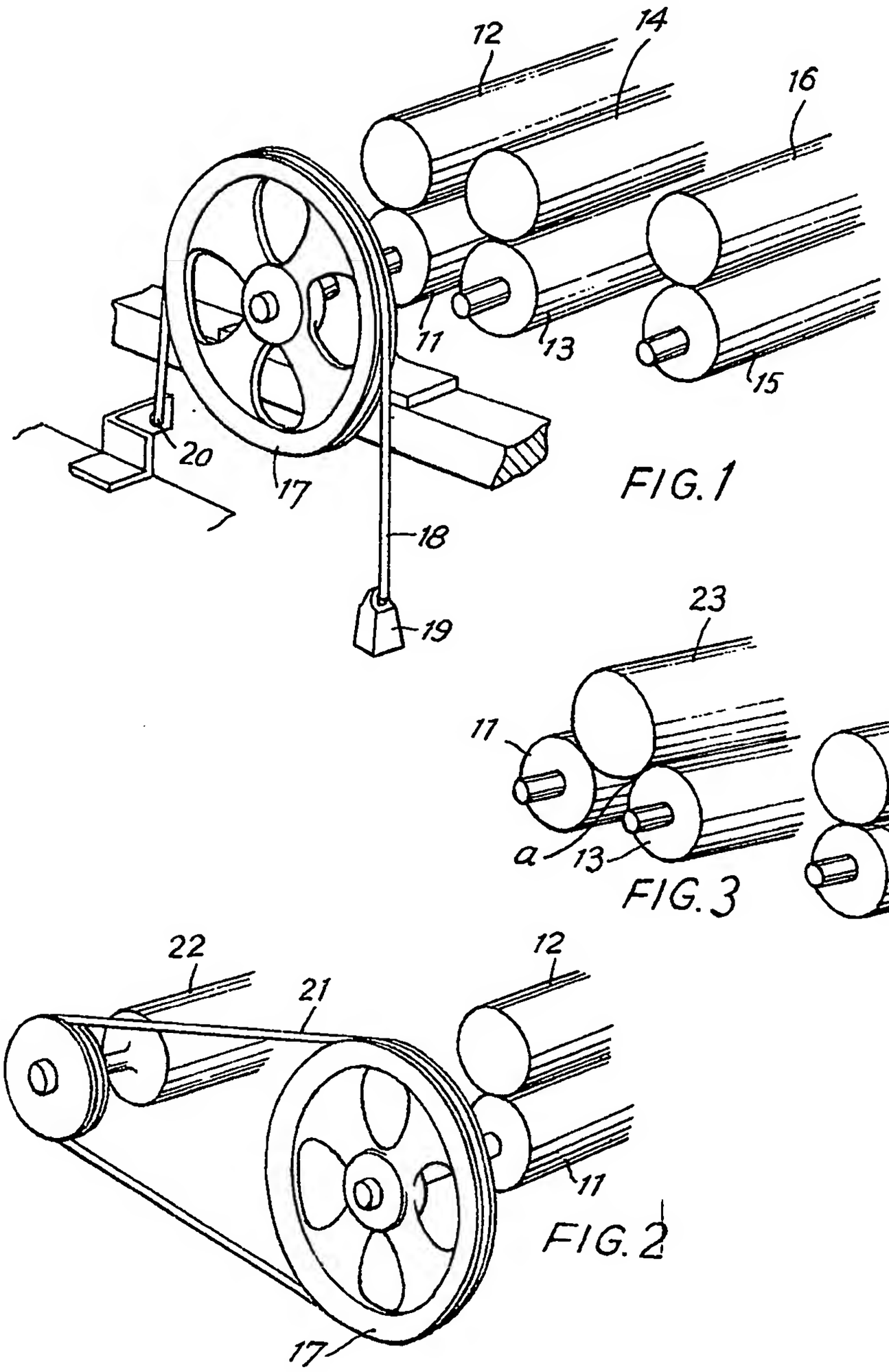

FIG. 1

FIG. 3

FIG. 2